

BURNED AREA EMERGENCY RESPONSE PLAN
2018 TERWILLIGER FIRE
ENGINEERING RESOURCE ASSESSMENT

I. OBJECTIVES

Field investigations of existing roads within the boundaries of the Terwilliger Fire located on the Willamette National Forest were conducted from Oct 9th-12th, 2018.

The purpose of the engineering investigation was to assess potential negative effects on roads, bridges, culverts and other hydraulic structures attributable to the post-fire condition of the watersheds. The investigation also looked at those safety and warning structures required to provide safe passage of motorists accessing the public lands on authorized roads within the burn area. This report will provide a general summary of the values at risk, observations and findings, and recommendations resulting from the investigation.

II. VALUES AT RISK

The watersheds burned in the Terwilliger Fire will experience increased runoff, sediment/ash laden flows, and debris flows. Increased flows may cause the capacity of drainage features to be exceeded and transported sediment and debris may cause culverts and other drainage features to fail. These impacts may cause uncontrolled flow to cross the road and damage the road prism with potential for structural failure of roads. The road prism may become impassible to vehicles and in extreme cases may be completely washed out due to fill slope failure. Road prisms may also be damaged due to falling rock and debris making the road impassible.

This report identifies roads and structures that will be impacted by post-fire debris flows and flooding, evaluates their current condition and vulnerability, and considers treatments to minimize the risks to public safety, Forest infrastructure (property), and the potential for increased post-fire runoff. The following table describes the threats to various resources and the assigned risk value determined during this assessment.

Critical Value at Risk	Risk	Value Category	Threat
FSR 19, 1900-500, 1985-115	High	Property	Damage to existing infrastructure from increased runoff, erosion, and debris flows.
Visitors/Recreating Public & Agency Personnel	High	Human Life & Safety	Falling trees, rolling rocks and other debris, washouts, debris flows, and loss of emergency egress.

III. OBSERVATIONS

A. Background

The Terwilliger Fire contain Forest Service system roads and non-system roads. System roads were classified into four basic categories:

- Maintenance Level (ML) 5. Assigned to roads that provide a high degree of user comfort and convenience. These roads are normally double-lane, paved facilities. Some may be aggregate surfaced and dust abated. The appropriate traffic management strategy is "encourage."

- Maintenance Level (ML) 4. Assigned to roads that provide a moderate degree of user comfort and convenience at moderate travel speeds. Most roads are double lane and aggregate surfaced. However, some roads may be single lane. Some roads may be paved and/or dust abated. The most appropriate traffic management strategy is "encourage." However, the "prohibit" strategy may apply to specific classes of vehicles or users at certain times.
- Maintenance Level (ML) 3. Assigned to roads open and maintained for travel by a prudent driver in a standard passenger car. User comfort and convenience are not considered priorities. Roads in this maintenance level are typically low speed, single lane with turnouts and spot surfacing. Some roads may be fully surfaced with either native or processed material.
- Maintenance Level 2. Assigned to roads open for use by high clearance vehicles. Passenger car traffic is not a consideration. Traffic is normally minor, usually consisting of one or a combination of administrative, permitted, dispersed recreation, or other specialized uses. Log haul may occur at this level. Appropriate traffic management strategies are either to (1) discourage or prohibit passenger cars or (2) accept or discourage high clearance vehicles.
- Maintenance Level 1. Assigned to intermittent service roads during the time they are closed to vehicular traffic. The closure period must exceed 1 year. Basic custodial maintenance is performed to keep damage to adjacent resources to an acceptable level and to perpetuate the road to facilitate future management activities. Emphasis is normally given to maintaining drainage facilities and runoff patterns. Planned road deterioration may occur at this level. Appropriate traffic management strategies are "prohibit" and "eliminate."

Non-system roads contained within the fire perimeter were not assessed.

Many of the roads assessed and within the fire perimeter are also planned to receive some type of maintenance or reconstruction under a Timber Sale that is currently planned, under an existing Maintenance Task Order or under fire suppression efforts. Those activities as proposed and planned would be beneficial to all the Critical Values identified in this report. The proposed BAER treatments would not interfere or change any of those planned activities.

Based upon Forest Service databases and field observations, there are approximately 46.5 miles of system roads within fire perimeter. Table 1 is a summary of these roads by category:

Table-1 Roads By Maintenance Level

Maintenance Level	Miles
ML5	10.0
ML4	0.30
ML3	2.30
ML2	25.3
ML1	8.4
Decommissioned	0.1
Non-FS Roads	0.1

B. Reconnaissance Methodology and Results

Due to the limited time and resources for reconnaissance and the quantity and condition of road segments within the fire perimeter, reconnaissance was prioritized by focusing on the higher use and more valuable roads within the post-fire intensity and severity maps. A total of approximately 34.18

miles (or approximately 74%) within the fire perimeter were examined in detail by the Engineering members and other Burned Area Emergency Response (BAER) team members. The roads examined are in Table 2 below:

Table-2 Roads Field Surveyed

Road #	Maintenance Level	Mileage within Burn
1900-000	5	10.0
1900-415	2	0.62
1900-420	2	0.16
1900-420	1	0.05
1900-421	4	0.30
1900-500	3	1.17
1900-500	2	2.89
1900-506	1	0.31
1900-507	1	0.42
1927-100	2	1.09
1927-140	2	1.21
1980-000	3	1.18
1980-206	2	0.84
1980-208	2	1.71
1980-209	1	0.74
1985-115	2	2.92
1985-266	1	0.54
1985-274	1	0.09
1985-276	1	0.70
1986-000	2	4.88
1994-000	2	2.36

Other roads inside the burned area were not field surveyed due to time constraints and the low value of the facilities which are primarily ML1 roads.

Additional comments and notes about the roads within the burned area can be found in the Critical Values Table.

The results of the field investigation identified potential risks to human life and safety and threats to the road system itself due to culvert and/or other structure failures.

C. Findings

The reconnaissance of the roads and upstream drainages during the field investigations identified very few issues pertaining to road stabilization and public safety. Most of the roads within the fire perimeter are in low or unburned soil severity classifications and less than 2 miles were in areas of

moderate to high soil burn severities. (See Appendix C for Soil Burn Severity by Road). The roads that have critical values at risk on which treatment needs were identified are listed in Table 3 below:

Table-3 Issues identified during field investigations

ROAD	DESCRIPTION & ISSUE
1900000	<ul style="list-style-type: none"> • High use ML 5 road. Scenic Byway • Portions in or above road in High or Moderate Soil Burn Severity. • Provides access to Cougar Creek Reservoir and Dam and access for administrative sites to cooperating agencies, Terwilliger Hot Springs, Three Sisters Wilderness, FS and private timber lands and roads. • Needs: general maintenance, hazard sign installation, and storm inspection and response. • Boone Creek Crossing recently reconstructed road, drainage and culvert. • Critical values at risk (human life and safety and property) <div data-bbox="667 837 1227 1257" data-label="Image"> </div> <p data-bbox="743 1287 1146 1318"><i>FSR 19 @ Boone Creek Crossing</i></p>
1900500	<ul style="list-style-type: none"> • High use ML 3/ ML 2 road • Portions in or above road in Moderate Soil Burn Severity. • Cougar Creek Reservoir and Dam and access for administrative sites to cooperating agencies, Three Sisters Wilderness and FS lands. • Road crossing many perennial drainages which feed Cougar Creek Reservoir. • Current Danger Tree Removal Ongoing. • Needs: general maintenance and storm inspection and response. • Critical values at risk (human life and safety and property)



FSR 1900-500 looking upstream from culvert

1985115

- ML 2 road accessing FS timber lands
- Portions in or above road in High or Moderate Soil Burn Severity.
- Stacked road above FSR 19 directly in high and moderate burn severity with several perennial drainage crossings (Boone and Rider Creek).
- Needs: road closure and storm inspections and response.
 - Critical values at risk (property)



IV. RECOMMENDATIONS

Based on field and GIS analysis, the Critical Values Table and BAER Team discussions following treatments to high risk roads:

1. Storm Inspection and Response

Situation: The roads at risk (FSR19, FSR 1900-500 AND FSR 1985-115) within the Terwilliger burned areas are primarily located below or in areas of high to moderate burn severity. There is an immediate and future threat to travelers along the roads within the burned area due to the increased potential for culverts to plug with sediment and debris which could washout sections of the roads. With the loss of vegetation, normal storm frequencies and magnitudes can more easily initiate erosion on the slopes and it is likely that this runoff will cover the roads or cause washouts at drainage facilities (culverts) or stream crossings. These events make for hazardous access to forest roads and put the safety of users at risk.

Description: Immediately upon receiving heavy rain and spring snowmelt, Engineering and District FS personnel will survey the roads within the fire perimeter. Survey will inspect road surface condition, ditch erosion, and culverts/inlet basins for capacity to accommodate runoff flows. Observations of rocks and sediment causing washouts and plugged culverts are identified and corrected before they worsen or jeopardize motor vehicle users. The inspecting personnel bring heavy equipment necessary to mechanically or, in some cases, response may require equipment rental to facilitate the removal of any obstructions from the roads and culvert inlets and catch basins where necessary. All excess material and debris removed from the drainage

system shall adhere to the sidecasting as reviewed by the archeologist and hydrologist. All work to be performed shall conform to FP03-Standard Specifications for Construction of Roads and Bridges on Federal Highway Projects and Forest Service Supplements.

The purpose of the monitoring is to evaluate the condition of roads and bridges for motorized access and to identify and implement additional work needed to maintain and/or repair damage to road surfaces and flow conveyance structures (culverts, bridges) across roads in order to provide safe access across FS lands.

Treatment Cost: Appendix B of this report includes the detailed cost break down of proposed BAER road storm inspection and response treatments.

Probability of completing treatment in first year prior to damaging storms or events: The proposed BAER road treatments are suitable for either force account road crews or private contractors. The probability of completing treatment is 90% likely.

Probability of treatment success: This treatment has a high probability of being successful. Further damage to roads can be prevented if the road storm inspection and response is used quickly after a storm event. For this treatment to be successful, it is imperative that Willamette NF employees monitor road conditions within the Terwilliger Fire as described in the treatment description section.

Recommendation: Monitor road drainage structures and debris flow treatment structures after significant storm events to ensure the maximum drainage capacity is maintained until the natural re-vegetation of the burned area has occurred. Maintain and/or repair any damage to road surfaces. Remove sediment and debris from drainage and treatment structures and repair headcutting in streams and drainages to prevent further degradation of channels. Monitor the movement of large woody debris and make a determination of whether or not the material should be removed before it contacts bridge piers, abutments, or culverts. See Appendix A for map.

See *Burned Area Emergency Response Treatments Catalog Chapter 4, Storm Inspection and Response* pages 149 -152 and *BAER Specification for Storm Patrols* for more information.

2. Road Hazard Warning Signs

Situation: Due to the severity of burn in some watersheds, combined with road location, trailhead, and/or developed recreation sites, the threat of falling trees, rolling rocks, and flash floods has increased significantly to critical values such as Human Life and Safety.

Description: This treatment will design and install burned area warning signs to caution forest visitors recreating within the burned area. The road warning sign will be placed where 1900000 road intersects with the fire perimeter. Signs should be placed for each direction of travel. It is consistent with the language provided in the BAER Treatments Catalog. The treatment is a component of the overall travel control devices for the burned area (USDA Forest Service-EM7100-15, 2005). The warning signs will identify the types of hazards to watch for roads.

Purchase and install signs at each of the identified locations consistent with Forest Engineering Standards at these locations. A Forest Service employee will inspect the signs for visibility, damage, or loss and replace as needed.

This treatment will inform users of the dangers associated with entering/driving within a burned area.

Treatment Cost: Appendix B of this report includes the detailed cost break down of proposed BAER road storm inspection and response treatments.

Probability of completing treatment in first year prior to damaging storms or events: The proposed BAER road treatments are suitable for either force account road crews or FS employees. The probability of completing treatment is 90% likely.

Probability of treatment success: The probability of motorist accessing routes or hitting objects not identified within the roadway is about 95%. The loss is difficult to estimate since this is a safety issue. One could conclude damages to a vehicle would occur but there is a greater risk of someone getting injured if their vehicle strikes something. If the treatments are implemented the probability of someone damaging their vehicle is greatly reduced.

Recommendation: Install "Burn Area Warning" signs along FSR 19 at primary road entry points into the fire perimeter to alert the travelers of the dangers ahead. Refer to other recent BAER implementation efforts on the Willamette National Forest for sign size, type, and style to ensure consistency in signage across the Forest. See Appendix A for map.

3. Road Closure

Situation: FSR 1985-115 is a ML 2 road and has portions that are in High to Moderate Soil Burn Severity and has many danger trees and rock fall potential. Public travel on this road would be unsafe.

Description: There is an existing gate at the beginning of this road that would remain closed until the road is deemed safe for public travel.

Treatment Cost: There would be no cost associated with this treatment.

Probability of completing treatment in first year prior to damaging storms or events: The probability of completing treatment is 100% likely.

Probability of treatment success: The probability of motorist or visitor accessing a road with a locked gate is about 10%. The loss is difficult to estimate since this is a safety issue.

Recommendation: Close gate on FSR 1985-115.

V. Management Recommendations

1. Storm Inspection and Response

Situation: Storm inspection and response is only funded by BAER funds for the initial year of implementation.

Recommendation: Continue storm inspection and response until vegetation has reestablished in affected watersheds or for at least a total of two years.



2. Low Risk Roads & Roads Outside Burn Perimeter

Situation: The drainage features and surfacing on many of the roads are in need of maintenance and re-construction. .

Recommendation: Maintain and/or reconstruct drainage features where appropriate. Continue with current Task Orders and Timber Sale Specified Road work that is planned.

VI. CONSULTATIONS

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VII. REFERENCES

- A. *Burned Area Emergency Response Treatments Catalog* December 2006 National Technology & Development Program Watershed, Soil, Air Management 0625 1801-SDTDC
- B. *Cost Estimating Guide for Road Construction* March 2012 USDA Forest Service Intermountain, Southwestern, Rocky Mountain Regions
- C. INFRA Travel Routes Inventory, and Quad Maps
- D. Federal standards for the construction of Roads and Bridges
- E. BAER Team meetings and discussions
- F. Timber Sale Specified Road Work Plans
- G. Suppression Road Work Plans
- H. Green Mountain EIS, McKenzie River Ranger District

IX. APPENDICES

- A. Burn Severity Terwilliger Fire Map with Proposed Road Work
- B. Road Life and Safety and Road Property Detailed Cost
- C. Terwilliger Soil Burn Severity Road Summary

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